

THE GEOLOGY AND PETROLOGY OF THE GREAT
SERPENTINE BELT OF NEW SOUTH WALES.

PART viii. THE EXTENSION OF THE GREAT SERPENTINE BELT
FROM THE NUNDLE DISTRICT TO THE COAST.

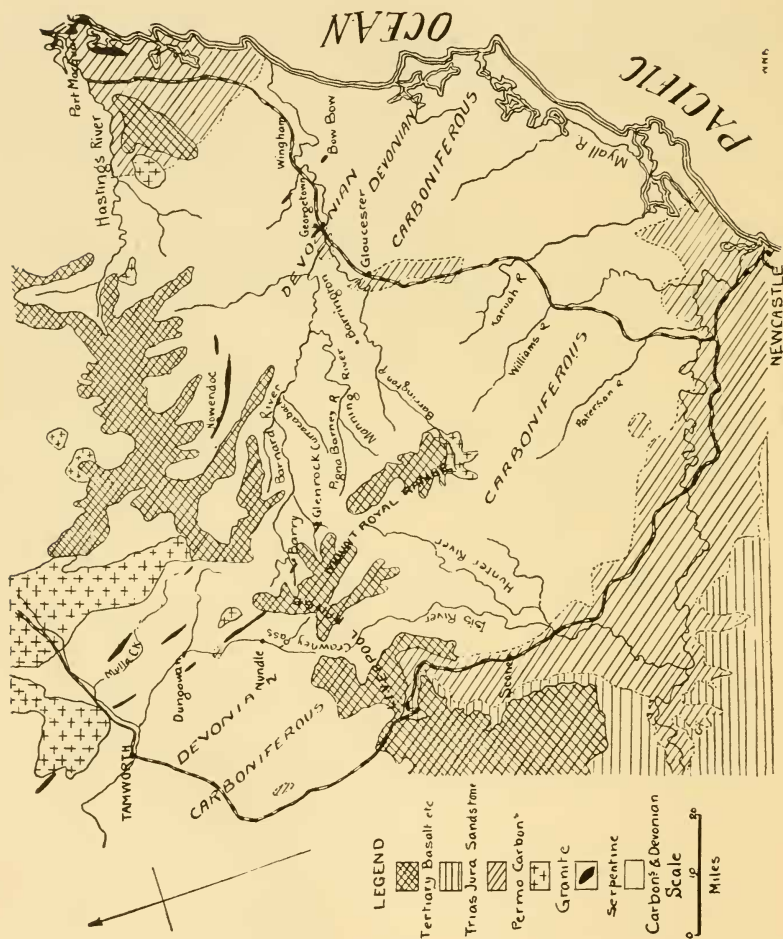
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(With one Text-figure).

The previous parts published have described, in greater or less detail, the whole of the country along the Serpentine Belt, extending from Warialda to Hanging Rock, a distance of nearly 150 miles. Some facts, however, have been collected with regard to the further extension of the Belt, which may be worthy of record before this series of papers is concluded.

Somewhat to the west of the Serpentine-line, and about twelve miles south of Nundle, commences, on Wombramurra Creek, one of the largest masses of limestone in the State, which mass continues for some miles across the Main Divide, at Crawney Pass, into the head of the Isis River. This has, as yet, been little studied. It was briefly described by Phillips, in 1875(1). Mr. Etheridge described a new coral therefrom, in 1898(2); and Mr. Dun, two years later, determined a large collection of fossils obtained by Mr. Cullen(3). It was visited by the writer in 1910, and has recently been studied by Mr. Carne, and is to be described in his forthcoming account of the limestones of New South Wales(4). Very little is known of its stratigraphical relationships to the other Devonian rocks; it seems to occur among a series of banded claystones like those of the upper portion of the Tamworth Series, or even of the Barraba Series, though, as

pointed out in previous papers, the lithology of the Tamworth Series is not very constant, and the cherty facies is more marked



in the Tamworth-Nundle region than elsewhere. The following fossils were found to be present in this limestone, the letters M., L., and N. indicating whether the forms are also present in the

Moore Creek, Loomberah, or Nemingha horizons respectively.

<i>Favosites gothlandica</i> ...	...	M., N.
<i>F. basaltica</i> var. <i>moonbiensis</i> ...	...	N.
<i>F. salebrosa</i> ...	...	M., N.
<i>F. multitabulata</i> ...	...	M?, L., N.
A Stromatoporoid ...	...	M., L., N.
<i>Diphyphyllum porteri</i> ...	...	M., L., N.
<i>D. sp.nov.</i>		
* <i>Sanidophyllum davidis</i> ...	...	M., N. (rare).
<i>Tryplasma</i> , sp.nov. ...	...	M.?, L.?, N.?
* <i>Spongophyllum giganteum</i> ...	...	M.
* <i>Actinocystis cornu-bovis</i> ...	...	M.
<i>Cyathophyllum</i> sp. ...	...	L.?
<i>Cystiphyllum australasicum</i> ...	...	L.?
* <i>Microplasma parallelum</i> ...	...	M.
<i>Heliolites porosa</i> ...	...	M., L., N. (rare).
* <i>Syringopora auloporoides</i> ...	...	M.
<i>Litophyllum konincki</i> ...	...	M., L., N.
<i>Alveolites</i> sp. ...	...	M.?, N.?
<i>Endophyllum schlueteri</i> .		
<i>Atrypa</i> sp. ...	...	M.?, N.?
<i>Euomphalus</i> sp. ...	...	M.?

The association of the species marked with an asterisk, and the abundance of *Heliolites* are features very characteristic of the Moore Creek limestone, with which the great development of pure grey or white limestone also accords. The absence of the great abundance of Stromatoporoids, or Pentameroid shells, or of the signs of shallow water, distinguishes this from the Loomberah Limestone; and the want of association with fragmental igneous rocks, or with banded cherts, separates it from the Nemingha Limestone. It seems permissible, therefore, to correlate it with the Moore Creek Limestone.

East from here, across the Main Divide, the Serpentine Belt extends across the headwaters of the Manning River, through extremely rugged and broken country. It is the deeply dissected remnant of a plateau, over which extends a widespread series of more or less alkaline basic rocks, which were described by Mr.

Andrews, at the head of the Hunter and Manning Rivers, as being of two types, "one, a holocrystalline rock with large augite crystals so abundantly scattered throughout its mass as to obtain for it locally the name of 'plum-pudding stone.' Other types found there are dense, fine-grained, vesicular olivine-basalts" (5). The writer has shown that, among these, are to be found various types of basalt, basanite, dolerite, essexite, teschenite, and theralite, with sometimes an abundance of nepheline (6, 7). Indeed, there is an assemblage of basic rocks quite analogous to those of the Bohemian Mittelgebirge, which Becke described as a typical instance of an assemblage of Atlantic rocks. The shapely cone of Wombramurra Peak, a few miles east of the Pass, was not visited by the writer, but is very analogous to the conical Gragin Peak near Delungra, Warialda, which Mr. Carne believes to be a centre of intrusion, and in which Mr. Card found olivine-dolerite. Mount Jellore, near Mittagong, 80 miles S.W. of Sydney, may possibly be of a like nature.

Serpentine occurs on this line at the Barry, at the head of the Barnard River, twelve miles distant from Nundle, and was here observed by Mr. Andrews, who remarked on the association with it of "diorites and basic rock-types," probably dolerites, and spilites (8). Mr. Longrigan, of the Barry, informed the writer of the occurrence of limestone east(?) of the serpentine on his property; and Mr. Stonier records the finding of *Favosites* in limestone on the Pigna Barney River, two miles above its junction with the Manning (9). Serpentine occurs again at Glenrock, some twenty-five miles south-east of Nundle (8), and local prospectors say that it is also present at the old "Polly Fogal" Diggings, which are not marked on any map, but are stated to be sixty miles east from Scone, and forty south-east of Nundle. An analysis of chromite obtained from here has been recorded (10). This must be near the Curracaback River, which is crossed by the serpentine (8).

North-east from this line, serpentine has been recorded from Nowendoc (8), doubtless among rocks of the Eastern Series, and will thus probably be on or near a line extending from the belt of serpentine recorded by Stonier (11), which extends from near

Dungowan Creek, at a point about six miles south-east of Dungowan township, across to the Mulla Creek, east of Moonbi. At the south end of this, the writer found antigoritic serpentine, and various intrusive doleritic rocks. A further northern continuation of this beyond the Moonbi granite is, perhaps, to be seen in the serpentine which occurs (*vide* D. A. Porter) near the head of Moore Creek, from which a nickeliferous opal was obtained(12).

Further to the south-east, Mr. Süssmilch and the writer(13) have observed the occurrence of serpentine at Mt. George, on the Manning River, and have remarked on the presence of the same rock at Glen Lewis, five miles to the north of this spot, and at Bow Bow near Tinonee, south of the Manning River, twelve miles to the south-east of the last-mentioned occurrence. This last record, we owe to Mr. Card, who received specimens therefrom. Between this group of intrusions of serpentine and Gloucester, to the south-west, there is a great development of Middle and Upper Devonian and Lower Carboniferous rocks, extremely like those in the areas to the north, described in the preceding parts of this series. The strike is generally N.W.-S.E., with a S.W. dip. In the Middle Devonian beds there is an immense development of spilite with pillow-structure, rising to form Kangat Mountain. The geology is further complicated by the presence of an infaulted outlier of Permo-Carboniferous rocks, perhaps analogous to that recorded from the Nundle district(14). What exactly is the relationship of this district to those further to the north, has yet to be discovered. It lies rather too far to the east to be in the direct continuation of the main Serpentine-line, unless (as is quite possible) the direction of that line has been bent to the E.S.E. in the Manning River valley. In the absence of such a deflection, it may be suggested that the George Town serpentine is a continuation of the Mulla-Nowendoc line of intrusions, and that the southerly continuation of the main Serpentine-line is indicated by the serpentine and chromite, which occurs near Barrington(15), and the serpentine recorded by Mr. Andrews, on the Myall River(8). If this be so, however, the Carboniferous and

Devonian rocks of this region are so remarkably little altered, for rocks east of the main Serpentine-line, as to indicate somewhat different conditions from those which have prevailed in the districts north of Nundle. In either case, it is probable that the Serpentine-line will eventually be traced from Nundle down to the coast, thus adding another hundred miles to the hundred and fifty already mapped, and thus forming one of the most continuous structural lines in the State.

A few words may be given with respect to the serpentines of Port Macquarie, which were described by Mr. Carne(16). In this region, the predominant strike is to the N.N.E. It has been suggested that the serpentines here lie on the same line as those of the Great Serpentine Belt, which has swung round from the S.S.E. to the S.E., and eventually into the N.N.E. direction, and thence swings further round to include the serpentines of the Clarence River, recorded by Professor David and others(17). The Serpentine-line, on this hypothesis, forms a discontinuous ring about the strongly compressed Permo-Carboniferous rocks and the great granitic masses of north-eastern New South Wales(18). The writer has pointed out, however, that the presence of a N.W. to N.N.W. strike so close to the coast as the Gloucester District renders this suggestion improbable, and indicates rather that the Port Macquarie N.N.E. line of strike is more likely to be on a virgation passing off from the main N.N.W. direction. Several such virgations have been noted between Bingara and Nundle, notably at Mundowey on the Namoi River(19), though they have not been traced into a greater divergence from the main direction than a N.-S. line of strike. Such an hypothesis, however, involves a much simpler distribution of folding forces than that necessary to explain the discontinuous ring of intrusions, though the latter would not be entirely without analogies. A comparison, though an extremely strained one, might be made with the discontinuous line of serpentine-intrusions around the Central Granite of the Austrian Tyrol, but it is very doubtful whether such a comparison would indicate any real analogy, so diverse are the other features in the two areas (see 20).

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